**Activities to help students conceptualize the multiplication of a fraction with a whole number.**

* ***Problem Solving*** An excellent way for students to begin the conceptual understanding of fractions is having the students solve real world problems which they can solve without the use of an algorithm. Select several of the following problems and encourage the students to draw pictorial representations of their solutions and then as a class develop the equation for each situation. Most students will think of this first set of problems as repeated addition of fractions.
  + Answer in fractions. Your neighbor is going on a trip. He would like you to let his dog outside morning, noon and evening. He offers to pay you ¼ of a dollar each time. How much money would you earn in 3 days? (1/4 \* 3 = 3/4 of a dollar) In 6 days? (1/4 \* 6 = 6/4 or 1 ½ of a dollar)

Example of Student Work



* + If you drink ½ cup of water four times a day how much water would you drink in a day? (1/2 \*4 =2)
  + Jill filled 5 glasses with 2/5 of a liter of juice in each glass. How much juice did she use? (5 \* 2/5 = 10/5 or 2)
  + John runs 2/3 of a mile every day. How many miles will John run in 5 days? (2/3 \* 5 = 10/3 or 3 1/3
  + Shari feeds her dog 1/3 of a cup of dog food every day. How much dog food does she need for a week? (1/3 \* 7 = 7/3 or 2 1/3)

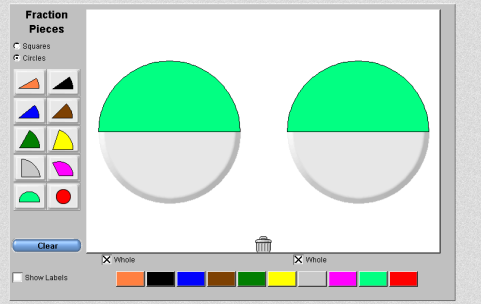
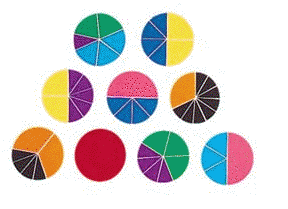
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* ***Problem solving with questions which use of.*** Another type of multiplication of fraction questions are asked using the word of – a fractional part of a whole. Students should also do problem solving with this type of problem.
  + You are to provide fruit for your next basketball game. There are 9 people on the team and 1/3 ask for bananas. How many bananas should you buy? (1/3 of 9 =3)
  + Joe is going on a 9 mile hike. How far will he have gone when he has walked 1/3 of the way? (1/3 of 9 = 3)
  + Juliann’s has 12 fish. 2/3 of the fish are gold. How many fish are gold? (2/3 of 12)

Student circles two out of every three fish.



* ***Manipulatives*** As students began to develop a conceptualization of what it means to multiply a whole number by a fraction you can start to practice the process of multiplication by using manipulatives. As you use the manipulatives begin by contextualizing the problems (e.g. for ½ x 3, you might say that you drink 1/2 of a glass of water every hour). Guide students in connecting their actions to the appropriate symbolic representation. Have the students become familiar with several manipulatives. Research has shown that students who develop multiple representations of the same concept tend to be more flexible in their thinking and retain new learnings longer.
  + Fraction pies (or bars) (physical or virtual manipulatives)
  + Virtual Manipulatives – Fraction Pieces <http://nlvm.usu.edu>
    - Ask the students to put out a 1/3 piece and find the answer to 3 x 1/3 If we make 1/3 three times bigger. Repeat for 4 x 1/5, 3/17, 5 x 1/3, 3 x 1/3, etc.
    - Ask the student to put out 2/3 pieces and then to find the answer to 4 x 2/3. Repeat for 2x ¾, 5 x 4/5, 4 x 5/6, etc.



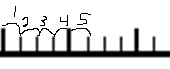
* + Number lines or Virtual Number Line

Virtual Manipulative Number Line Bars <http://nlvm.usu.edu/en/nav/frames_asid_265_g_2_t_1.html?open=activities&from=category_g_2_t_1.html>

Printable number lines <http://www.helpingwithmath.com/resources/oth_number_lines.htm>

* + - Explain that to the students that they have a jumping frog (walker, runner, etc). Each time it moves it goes ¼ of an foot. Using the number line show how far the frog will get in 5 moves or if the frog went five times further. Repeat for a variety of numbers.

Student example of ¼ five times.



* Pictorial models– Once students have developed the conceptual understanding of the multiplication of fraction process by using manipulatives, give the students additional practice and fluency by having them do a number of pictorial models.

Fraction Circle Template: <http://mathwire.com/templates/fractioncircles.pdf>

Fraction Boxes Template: <http://mathwire.com/templates/fractionsquares.pdf>

* + Give the student a page of small boxes or circles
  + Ask them to demonstrate, using the images
    - 2/3 of 2 or 2/3 x 2 (They would split each of the two boxes into 1/3’s and color in 2 of the 1/3s of each box.
    - Repeat for a variety of problems.
* Teach the students that when multiplying you can use replace the x with the word of
  + Begin with whole groups. If you have 3 groups of 2 cards how many cards would you have?
    - Use a manipulative or draw the pictures of two groups of 3.
    - Write the symbolic sentence: 3 of 2 is 6 and 3 x 2 = 6
    - Repeat with different problems until students are comfortable with writing sentences both ways
  + Ask students to demonstrate, calculate, and compare answer to the following.
    - 3 x 1/3 (three groups of 1/3)
    - 1/3 of 3 (1/3 of 3)
    - Repeat with other numbers until students transfer the idea that the two perspectives are equal.

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* ***Symbolic practice*** <http://www.edhelper.com/math/fractions9.htm>
* ***Rubric and printable assessment*** <http://www.rda.aps.edu/mathtaskbank/pdfs/instruct/3-5/i35candy.pdf>

Additional Information

Multiply Fractions Lines/Circles- Gives a visual picture of multiplying a fraction with a whole number.

<http://www.visualfractions.com/multiply.htm>

Fraction Mystery Picture- Students multiply fractions times whole numbers to uncover a picture.

<http://www.dositey.com/2008/math/mistery2.html>

Multiply Fractions Lines/Circles- Gives a visual picture of multiplying a fraction with a whole number.

<http://www.visualfractions.com/multiply.htm>